

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

3711-000116

U.S. APPLICATION NO. (If known, see 37 CFR 1.5

**09/937807**

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/02822	30 March 2000 (30.03.00)	02 April 1999 (2.04.99)

TITLE OF INVENTION SPRAYING EQUIPMENT

**JC14 Rec'd PCT/PTO 26 SEP 2001**

APPLICANT(S) FOR DO/EO/US ANNONIER, Claude; NUFFER, Sebastien and MALLARACH CAPDEVILA, Juan

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1.  This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2.  This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3.  This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4.  The US has been elected by the expiration of 19 months from the priority date (Article 31).
5.  A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a.  is attached hereto (required only if not communicated by the International Bureau).
  - b.  has been communicated by the International Bureau.
  - c.  is not required, as the application was filed in the United States Receiving Office (RO/US).
6.  An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a.  is attached hereto.
  - b.  has been previously submitted under 35 U.S.C. 154(d)(4).
7.  Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a.  are attached hereto (required only if not communicated by the International Bureau).
  - b.  have been communicated by the International Bureau.
  - c.  have not been made; however, the time limit for making such amendments has NOT expired.
  - d.  have not been made and will not be made.
8.  An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9.  An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10.  An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11 to 20 below concern document(s) or information included:**

11.  An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12.  An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13.  A **FIRST** preliminary amendment.
14.  A **SECOND** or **SUBSEQUENT** preliminary amendment.
15.  A substitute specification.
16.  A change of power of attorney and/or address letter.
17.  A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18.  A second copy of the published international application under 35 U.S.C. 154(d)(4).
19.  A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20.  Other items or information:

Application Data Sheet, Form 1449 with copies of references cited thereon (4 US, 1DE, 1EP, 1WO & International Search Report PCT/EP00/02822), copy of International Preliminary Examination Report and Annexes and return postcard.

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

09/937807

INTERNATIONAL APPLICATION NO.

PCT/EP00/02822

ATTORNEY'S DOCKET NUMBER

3711-000116

21.  The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. .... \$1000.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY**

Surcharge of \$130.00 for furnishing the oath or declaration later than  20  30 months from the earliest claimed priority date (37 CFR 1.492(e)).

\$ 860.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$
Total claims	8 - 20 =	0	x \$18.00	\$ 0.00
Independent claims	1 - 3 =	0	x \$80.00	\$ 0.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$ 0.00

**TOTAL OF ABOVE CALCULATIONS =**

<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.	\$ 860.00
	\$ 0.00

**SUBTOTAL =**

Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).	\$ 860.00
	\$ 0.00

**TOTAL NATIONAL FEE =**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +	\$ 860.00
	\$ 0.00

**TOTAL FEES ENCLOSED =**

	Amount to be refunded:	\$
	charged:	\$

- a.  A check in the amount of \$ 860.00 to cover the above fees is enclosed.
- b.  Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c.  The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.
- d.  Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

W. R. Duke Taylor  
 Harness, Dickey & Pierce, P.L.C.  
 P. O. Box 828  
 Bloomfield Hills, Michigan 48303  
 United States of America


W. R. Duke Taylor  
NAME31,306  
REGISTRATION NUMBER

Dated: SEPT 26, 2001

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: Not yet assigned

Filing Date: Not yet assigned

Applicant: ANNONIER, et al.

Title: SPRAYING EQUIPMENT

Attorney Docket: 3711-000116

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Box Patent Applications  
Hon. Commissioner of Patents and Trademarks  
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Applicants herewith submit this Preliminary Amendment to the application filed herewith, for consideration prior to the calculation of the filing fee, as follows:

IN THE CLAIMS

Please amend claims 5 – 8 in accordance with the following rewritten claims in clean form. Applicant includes herewith an Attachment for Claim Amendments showing a marked up version of each amended claim.

CLAIMS

5. (AMENDED) A device according to claim 1, characterised in that there are several said further containers communicating with a common said mixer (6);
  - and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

6. (AMENDED) A device according to claim 1, characterised in that a flow of

gas is provided to the spraying means to assist the spraying at a constant rate.

7. (AMENDED) A device according to claim 1, characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);
- and in that the mixture of diluent(s) and additive is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

8. (AMENDED) A device according to claim 1, characterized by several spraying systems (7) each able to be adapted to the throughput of solid product.

### REMARKS

Claims 1 – 8 remain pending in the application. Claims 5 – 8 have been amended.

The purpose of this preliminary amendment is to remove multiple dependent claims from the application to reduce filing costs. Consideration of the application as amended is requested. It is submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

Respectfully submitted,

Dated: Sept 26, 2001

By: W.R. Duke Taylor  
W. R. Duke Taylor  
Attorney for Applicants  
Registration No. 31,306  
(248) 641-1600

Harness, Dickey & Pierce  
P. O. Box 828  
Bloomfield Hills, MI 48303

**ATTACHMENT FOR SPECIFICATION AMENDMENTS**

The following is a marked up version of each replacement paragraph and/or section of the specification in which underlines indicates insertions and brackets indicate deletions.

5. (AMENDED) A device according to claim 1 [any one of claims 1 to 4], characterised in that there are several said further containers communicating with a common said mixer (6);

- and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

6. (AMENDED) A device according to claim 1 [any of claims 1 to 5], characterised in that a flow of gas is provided to the spraying means to assist the spraying at a constant rate.

7. (AMENDED) A device according to claim 1 [any one of claims 1 to 3], characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);

- and in that the mixture of diluent(s) and additive is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

8. (AMENDED) A device according to claim 1 [any one of claims 1 to 5],

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Preliminary Amendment

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characterized by several spraying systems (7) each able to be adapted to the throughput of solid product.

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SPRAYING EQUIPMENT

The present invention relates to a novel piece of equipment for spraying a liquid additive composition onto a solid product, for example a foodstuff. It relates 5 more particularly to apparatus which allows homogeneous spraying of very small amounts of a liquid constituent onto relatively large amounts of solid product.

The term "solid product" as used herein is intended to embrace a product in the form of pellets, or 10 in the form of a crumble, or in the form of a powder which can be used to form a mash feed.

A preferred application of the present invention relates to apparatus for spraying liquid food additives which are to be present in the foodstuff in small weight 15 amounts and which consist essentially of enzymes and/or vitamins and/or carotenoids. The said additives are often added in very small quantities of the order of a few tens or hundreds of grams per ton of foodstuffs.

In the prior art there are various examples of 20 mixing additives to a major constituent, for example in US-A-4108335, US-A-5516625 and DE-A-4413249.

Where the major constituent receiving the additive minor constituent is in solid form it has been proposed previously to dilute the additive in a carrier 25 liquid, for example as proposed in WO-A-97/16964. Another example of dilution of the additive is disclosed as one optional possibility in Patent EP 789291, where there is described apparatus comprising:

- one or more thermostatted containers which 30 contain the enzyme which may be in pre-diluted form;
- a system for extracting the liquid enzyme from its container;
- a flow regulation valve;
- a flow meter with high sensitivity;
- an injection system which has an adjustable angle of atomization; and
- a microprocessor-controlled electronic system

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for regulating the dose of the liquid enzyme.

Although this spraying system, which is very efficient and has been used commercially for many years, allowed the introduction of a liquid food additive which might be in pre-diluted form, it was not constructed with a view to allowing continuous variation of dilution. With use it appeared that this system was not perfectly adapted for enzymes which had to be introduced at different concentrations, or for the introduction of several different constituents which are mutually incompatible, whether from a physical or chemical point of view.

Thus, the introduction of additives such as enzymes in aqueous solution could not be carried out with the concomitant introduction of additives in lipid form such as the vitamins A or E, or proteases could not be introduced with protein enzymes.

In the prior system, the dilution of the enzyme was determined in advance and the quantity of diluted enzyme was adjusted by the microprocessor-controlled flow meter to be related to the amount of foodstuff which passed on a conveyor belt. With this system, there was a constant adaption of the flow rate of the spraying flow to the amount of dry foodstuffs transported by the conveyor belt.

25 However, it has now been found, unexpectedly, that it is easier and more advantageous to adapt the dilution of the additive in the diluent (water) both to the amount of dry foodstuffs transported by a conveyor belt and to the flow of the additive so as to keep the 30 total spraying flow constant for a constant flow rate of dry foodstuffs.

Thus, the present invention relates to a device for spraying an additive diluted with a diluent therefor, consisting of:

- a diluent container;
- a further container for a said additive;
- at least one mixer;
- conduits communicating said diluent container and

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additive container with said mixer for allowing the dilution of the additive by the diluent from said diluent container;

5 - spraying means connected to receive the output from said at least one mixer with a constant flow rate and to spray it at a spray zone; and

10 - means for transporting a solid product to said spray zone to receive the additive;

15 - wherein in said conduits there is a respective regulation valve per liquid associated with the first mentioned and further containers; there are dilution control means for controlling said regulation valves to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of the additive in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate;

20 - characterised in that the spray nozzle is aimed towards a conveyor for a solid product to be sprayed, and in that the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.

The present invention preferably employs static mixers.

25 The transporting means may be a conveyor and the regulation valves may be managed by a microprocessor which, according to the weight of solid product present on the conveyor where the additive/ diluent mixture is sprayed, modulates the proportional flow rate of the different additives and diluent in such a way as to 30 maintain a spraying flow rate which is constant and proportional to the weight of solid product.

If, according to Figure 1, the flow is followed starting from the water container (1), the liquid is pumped 35 by the pump (3) as far as the flow meter (4), then is introduced into a regulation valve (5) before being introduced into the mixer (6).

If the flow is followed starting from the first additive container (2), the liquid is pumped by the pump (3) as far as the flow meter (4), then is introduced into a regulation valve (5) before being introduced into the 5 mixer (6). This is the case for each further additive.

The mixture of water and several different additives is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8) on a flow of granules. Although the granules may be travelling on a 10 conveyor, e.g. a horizontal belt conveyor it is preferable for them to be sprayed while dropping vertically from a pelleting chiller. Any other transport means for the solid product can be used.

When several of the additives cannot be mixed 15 together in the aqueous flow, several spraying systems may be individually adapted to the throughput of the apparatus, so as to give a variable application of each additive to the solid product, while maintaining optimum flow through the spray nozzle. It is evident that, even if 20 the additives are mutually compatible, it may be advantageous to adapt several spraying nozzles to the outlet of the apparatus.

The advantages of the present device are as follows:

- 25            - homogeneous distribution of the liquid additive(s) onto the foodstuff  
              - regulation of the flow rate of one of the additives without necessarily disturbing the functioning of the atomization nozzle
- 30            - conformity with the statutory demands on premixed additives  
              - mixing of mutually unstable products.

It has been found that with the system of the present invention it is possible to achieve a wide 35 variation in the flow rates of the various liquids, and a precisely controlled application rate of the at least one additive to the solid product. For example, the

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application rate of any one of the additives can be in the range of from 1 litre to 15 litres per hour, and as an example it is possible for two separate additives to be introduced to the diluent water flow, one at the rate of 5 1 litre per hour and the other at a flow rate of 15 litres per hour.

In order to maintain optimum flow conditions at the spray nozzle, the flow of water will be selected so as to provide the required flow rate which may be in the 10 range of from 20 - 100 litres per hour per spray nozzle.

Using such values, it is possible to achieve a homogeneous application of from 0.5 to 1 litre of an additive per tonne of solid foodstuff granules passing through the apparatus.

15        Although throughout the present application there is reference to a solid product to which the additive/diluent mixture is applied, this is intended to denote that the product is not flowable, and in the preferred use of the apparatus the solid product will be a 20 dry product, preferably in granular form.

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CLAIMS

1. A device for spraying an additive diluted with a diluent therefor, consisting of:
  - 5 - a diluent container (1);
  - a further container (2) for a said additive;
  - at least one mixer (6);
  - conduits communicating said diluent container and additive container (1 and 2) with said mixer (6) for allowing the dilution of the additive by the diluent from said diluent container (1);
  - spraying means (7) connected to receive the output from said at least one mixer with a constant flow rate and to spray it at a spray zone; and
- 15 - means for transporting a solid product to said spray zone to receive the additive;
  - wherein in said conduits there is a respective regulation valve (5) per liquid associated with the first mentioned and further containers (1, 2); there are dilution control means for controlling said regulation valves (5) to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of the additive in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate;
  - characterised in that the spray nozzle is aimed towards a conveyor for a solid product to be sprayed, and in that the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.
- 30 2. A device according to claim 1, characterised in that one or more conduits connecting a diluent container or an additive container to a mixer are associated with

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respective flow meters.

3. A device according to claim 1, characterised in that there are several additive containers (2) connected to said mixer, each said additive container being associated 5 with a respective additive flow meter (4) and additive flow regulation valve (5)

4. A device according to claim 1, characterised in that the or each mixer is a static mixer.

5. A device according to any one of claims 1 to 4, 10 characterised in that there are several said further containers communicating with a common said mixer (6);

- and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

15 6. A device according to any of claims 1 to 5, characterised in that a flow of gas is provided to the spraying means to assist the spraying at a constant rate.

7. A device according to any one of claims 1 to 3, 20 characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive 25 pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);

- and in that the mixture of diluent(s) and additive 30 is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

8. A device according to any one of claims 1 to 5, characterised by several spraying systems (7) each able to be adapted to the throughput of solid product.

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Fig.1.

